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The Mineral Industry of Thailand

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This publication is a chapter from the current Bureau of Mines Minerals Yearbook, comprising *Volume I, Metals and Minerals; Volume II, Area Reports: Domestic; Volume III, Area Reports: International.* The separate volumes of the Yearbook are sold by the Superintendent of Documents, Washington, D.C. 20402.

The Mineral Industry of Thailand

By Gordon L. Kinney[1]

Thailand produced 22 nonmetallic, 14 metallic, and 3 fossil fuel minerals or mineral-based products during 1984. Four of these were of consequence on the world mineral market. Thailand was still the major producer of tantalum in the form of tin smelter slags. Its tin production ranked third in the world, and its barite and fluorite production was among the top 10 producers. Domestically important amounts of antimony, cement, gypsum, kaolin, lead, limestone, manganese, salt, sand, talc, and tungsten were also produced. The fossil fuels were becoming economically more important. Valued at only a few million dollars 6 years ago, domestic production substituted for over $400 million[2] worth of imported energy in 1984.

The Thai mineral industry experienced a modest recovery in 1984, based mainly on increased production of fluorite, gypsum, lignite, and zinc. The value of the annual mineral production (excluding natural gas and petroleum) was estimated to have risen 15% to $409 million, after declining the previous 3 years. The performance of the industry continued to be affected by depressed world demand for minerals, particularly for tin, which accounts for 65% of total mineral production value (excluding natural gas and petroleum).

The Department of Mineral Resources (DMR) authorized two U.S.-Thai joint-venture enterprises to explore and develop potash deposits in separate areas of the northeast. Completion of a tantalum processing plant in Phuket was delayed again because of unfavorable world prices and problems in attracting foreign investors. The long-planned soda ash plant was still being debated at yearend. The November 1984 opening of the zinc smelter at Tak, in Tak Province, promises to give a boost to the economy of the whole Province.[3]

The comprehensive mineral resources development project was to have been started during 1984. Kenting Earth Sciences Ltd. of Canada was selected out of the three short-listed bidders for the airborne geophysical survey of the entire country. The 514,000-square-kilometer survey reportedly will be the biggest geophysical survey of its type ever attempted. The project was being funded in part with a $39 million Asian Development Bank loan. Data collection will require about 2 years, followed by another 2 years of interpretation and map compilation and production.

The gross domestic product (GDP) recorded an increase of 6%, the same as in 1983. The mining and construction sectors each contributed more than their proportional share of the GDP increase—the mining sector considerably more at 10.2%. Private investment increased only 4.3% compared with 20.0% in 1983. The inflation rate based on the Consumer Price Index rose only 0.9%, sustaining its low level for the third consecutive year. The Wholesale Price Index declined by 30% as a result of a decline in agricultural product prices while other product prices either remained unchanged or increased only marginally. Overall real income rose by 2.5%. Income earned from the mining sector rose by 4.1% after declining for 3 consecutive years.

PRODUCTION

Mining output increased by 10.2%, a revival from the decline of the last 3 years.[4] This was attributed to the rise in the production of natural gas, condensate, and the first full year of commercial crude oil production.[5] Other traditional mineral outputs, namely, antimony, fluorite, gypsum, lignite, limestone, and tungsten, recovered owing to the increase in both domestic and foreign demand. Tin production, Thailand's most important mineral export, rose marginally after a substantial 4-year decline. Zinc metal production was inaugurated in November at the Tak electrolytic refinery in northern Thailand.

Natural gas production increased dramatically as new wells were brought on-line in the Gulf of Thailand. The politically sensitive shortfall of gas in 1983 was eliminated, and 350 million cubic feet per day was to be available by mid-January 1985. A production capacity of 450 million cubic feet per day was scheduled to be available shortly thereafter, which is more than the existing industries and utilities can presently utilize. Union Oil Co. of Thailand, the operator of the gasfields, was thus being put in a position of possibly having to restrict its output until new consumers can be brought on-line.

Production of indigenous liquefied petroleum gas (LPG) and petrochemical feedstock was begun with the November completion of the gas separation plant in Rayong Province.

Table 1.—Thailand: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1980	1981	1982	1983	1984[p]
METALS					
Antimony:					
Ore and concentrate:					
Gross weight	6,862	2,820	1,567	2,808	4,636
Metal content[e]	2,916	1,199	666	1,193	1,970
Metal, smelter	22	36	28	13	--
Columbium and tantalum ores and concentrates, gross weight:[3]					
Columbite	213	49	39	549	477
Tantalite	143				
Total	356	49	39	549	477
Stuverite (mixed columbite-tantalite)	30[4]	44	10	275	30
Iron and steel:					
Iron ore:					
Gross weight	84,966	62,472	26,750	40,304	60,670
Iron content	46,731	34,360	14,713	22,167	33,369
Metal:					
Pig iron	17,738	10,310	6,338	159	--
Ferroalloys:					
Ferromanganese	112	369	--	--	--
Ferrosilicon	60	280	--	--	--
Steel:					
Crude	450,000	300,000	312,158	243,900	380,971
Semimanufactures (selected):					
Bars	321,517	109,711	229,203	385,000	281,934
Galvanized iron sheets	129,342	151,620	126,890	123,679	132,455
Tinned plates	70,183	78,834	62,227	73,119	91,974
Lead:					
Mine output, metal content of 42.5% Pb concentrate	10,560	17,283	18,580	21,015	16,662
Metal: Ingot, secondary	1,667	548	929	3,174	6,198
Manganese ore:					
Chemical-grade, over 75% MnO_2	11	5	12	--	8
Battery- and chemical-grade, 75% MnO_2	3,996	5,205	3,398	4,804	6,110
Metallurgical-grade, 46% to 50% MnO_2	50,303	5,707	4,348	1,906	2,577
Total	54,310	10,917	7,758	6,710	8,695
Rare-earth metals:					
Monazite concentrate, gross weight	152	107	162	277	298
Xenotime	52	45	46	38	28

See footnotes at end of table.

Table 1.—Thailand: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1980	1981	1982	1983	1984[p]
METALS —Continued					
Tin:					
Mine output, metal content	33,685	21,474	26,109	19,943	21,960
Metal, smelter, primary	34,689	32,636	25,479	18,467	19,729
Titanium: Ilmenite concentrate, gross weight	--	37	18	205	148
Tungsten concentrate:					
Gross weight	3,134	2,348	1,661	1,092	1,439
Metal content	1,615	1,209	855	562	741
Zinc:					
Mine output, gross weight	--	--	--	--	147,993
Mine output, metal content	--	--	--	--	41,138
Metal, smelter, primary	--	--	--	--	[e]3,000
Zirconium ore and concentrate, gross weight	61	104	196	199	290
NONMETALS					
Barite	305,057	307,046	339,948	187,437	174,918
Cement, hydraulic thousand tons	5,337	6,263	6,609	7,263	8,240
Clays:					
Ball clay	1,557	1,856	2,200	4,960	2,520
Kaolin	19,934	14,086	17,846	36,350	58,616
Kaolinite (dickite)	5,020	7,450	--	--	--
Diatomite	1,982	128	80	425	471
Feldspar	24,158	24,243	19,526	47,908	74,404
Fluorspar:					
Crude mine output:					
High-grade	172,784	157,311	176,084	159,959	230,228
Low-grade	133,547	113,667	106,609	77,716	64,940
Total	306,331	270,978	282,693	237,675	295,168
Salable product:					
Acid-grade (beneficiated low-grade)	60,108	55,181	81,024	46,689	57,151
Metallurgical-grade	172,784	157,311	176,084	159,959	230,228
Total	232,892	212,492	257,108	206,648	287,379
Graphite	2,074	1,800	630	86	--
Gypsum	411,977	540,383	753,433	760,361	1,110,660
Phosphate rock, crude	5,570	2,610	4,265	5,158	3,075
Salt:					
Rock	16,744	11,000	11,100	5,679	9,850
Other[e]	165,000	165,000	165,000	165,000	165,000
Sand, silica	171,000	76,330	82,820	116,094	166,787
Stone:					
Calcite	360	2,325	1,020	1,871	1,272
Dolomite	8,130	7,510	9,662	7,927	10,364
Limestone for cement manufacture only thousand tons	3,958	5,486	6,371	8,936	9,223
Marble	5,649	8,016	9,311	26,428	37,927
Marl for cement manufacture only thousand tons	1,939	1,787	458	--	--
Quartz, not further described	7,828	20	7,531	15,159	20,687
Shale for cement manufacture only thousand tons	801	1,124	1,248	1,200	1,564
Talc and related materials:					
Pyrophyllite	10,350	10,370	19,989	18,875	26,851
Talc	1,376	1,665	2,009	1,273	1,628
MINERAL FUELS AND RELATED MATERIALS					
Coal: Lignite thousand tons	1,427	1,686	1,964	1,866	2,337
Natural gas (gross production) million standard cubic feet	--	--	47,036	56,762	85,506
Petroleum:					
Crude thousand 42-gallon barrels	[e]110	[e]100	[3]3,832	2,401	5,387
Natural gas condensate do.	--	--	NA	2,379	3,008
Refinery products:					
Gasoline do.	11,511	11,558	12,366	13,365	12,620
Jet fuel do.	4,948	5,941	5,648	6,275	6,432
Kerosine do.	1,794	2,293	2,277	2,725	1,539
Distillate fuel oil do.	17,551	17,331	17,879	19,198	17,409
Residual fuel oil do.	16,180	17,018	15,201	13,591	15,494
Liquefied petroleum gas do.	1,536	1,730	1,255	1,434	1,541
Naphtha do.	1,530	1,275	[e]1,300	[e]1,300	--
Asphalt do.	727	854	[e]900	[e]900	--
Refinery fuel and losses and unspecified do.	[e]1,670	[e]1,740	[e]1,710	[e]1,700	2,671
Total do.	57,447	59,740	58,536	60,488	57,706

[e]Estimated. [p]Preliminary. NA Not available.

[1]Includes data available through July 23, 1985.

[2]Excludes columbium- and tantalum-bearing tin slags, which make Thailand the world's largest source of newly mined tantalum.

[3]Includes natural gas condensate.

TRADE

After 3 consecutive years of decline, Thai exports of minerals and metals (i.e. tin) increased slightly in 1984. Once Thailand's leading foreign exchange earner, tin now ranks ninth among exports. The value of tin exports declined 3% from that of 1983 to $233 million, mainly because of the fall in world tin prices. Significant increases in export volumes, however, were registered in unground barite, fluorite, and gypsum. Although the Government prohibits the export of tin concentrate, DMR estimated that up to 5,000 tons per year was smuggled out of the country, mainly to Singapore. This figure was not reflected in official trade statistics.[6]

Table 2.—Thailand: Exports and reexports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	Destinations, 1983: United States	Destinations, 1983: Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	1,337	908	--	Japan 195; Malaysia 191; Nepal 185.
Antimony: Ore and concentrate	2,796	3,037	1,088	Republic of Korea 806; Brazil 439; Belgium-Luxembourg 294.
Columbium and tantalum: Ore and concentrate	93	125	28	West Germany 90.
Iron and steel: Metal:				
Scrap	r7,850	1,712	121	Japan 1,480.
Semimanufactures:				
Tubes, pipes, fittings	51,110	52,502	798	ngapore 14,399; Hong Kong 9,897; Saudi Arabia 6,911.
Unspecified	2,682	756	--	Italy 271; Laos 182; India 48.
Lead: Ore and concentrate	37,636	42,737	--	Japan 16,200; Netherlands 11,500; Belgium-Luxembourg 6,500.
Manganese: Ore and concentrate, metallurgical-grade	2,000	(2)	--	All to Belgium-Luxembourg.
Silver:				
Waste and sweepings troy ounces	--	8,038	--	All to Japan.
Metal including alloys, unwrought and partly wrought thousand troy ounces	2,007	3,304	2,307	West Germany 549.
Tin:				
Ore and concentrate	697	--		
Metal including alloys:				
Unwrought	25,542	18,876	7,303	Taiwan 5,951; Japan 3,981.
Semimanufactures kilograms	50	1,500	--	All to West Germany.
Tungsten: Ore and concentrate	1,462	1,207	433	Netherlands 308; West Germany 214; Japan 101.
Zinc: Metal including alloys, all forms	r972	153	(3)	Laos 133.
Other: Ashes and residues	2,525	2,819	1,492	United Kingdom 997; Mexico 200.
NONMETALS				
Barite and witherite	287,888	205,443	43,586	Indonesia 65,625; Saudi Arabia 51,750.
Cement	254,357	172,786	--	Malaysia 96,830; Bangladesh 27,933; Indonesia 19,006.
Diamond:				
Gem, not set or strung carats	61,554	49,115	1,130	Belgium-Luxembourg 17,942; Hong Kong 14,202.
Industrial stones do	1,130	--		
Unsorted do	2,879	373	--	All to Israel.
Diatomite and other infusorial earth	--	153	--	All to Singapore.
Feldspar	3,707	12,621	(3)	Taiwan 8,000; Malaysia 1,944; Singapore 1,776.
Fertilizer materials: Manufactured:				
Ammonia	1	4	--	All to Laos.
Nitrogenous	875	--		
Phosphatic	120	--		
Potassic	62	--		
Unspecified and mixed	469	431	--	Saudi Arabia 358; Brunei 55.
Fluorspar	182,388	183,602	4,400	Japan 89,744; U.S.S.R. 32,000; Taiwan 17,896.
Gypsum and plaster	377,148	491,127	--	Indonesia 143,950; Malaysia 140,219; Taiwan 94,550.
Precious and semiprecious stones other than diamond:				
Natural kilograms	144,298	103,502	2,024	Hong Kong 89,779; Japan 3,034.
Synthetic do	54	180	9	Republic of Korea 66; Kuwait 43; Switzerland 36.
Salt and brine	65,109	47,482	1	Malaysia 32,674; Singapore 14,471.

See footnotes at end of table.

Table 2.—Thailand: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	Destinations, 1983	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	110	408	--	Bangladesh 300; Bahrain 69.
Worked	475	1,542	(2)	Bangladesh 1,301.
Dolomite, chiefly refractory-grade	5,160	6,993	--	Singapore 6,060.
Limestone other than dimension	2,713	3,471	--	Malaysia 2,251; Singapore 1,177.
Quartz and quartzite	12,759	13,604	--	Japan 11,000; Singapore 1,667.
Sand other than metal-bearing	623	1,721	--	Mainly to Malaysia.
Talc, steatite, soapstone, pyrophyllite	3,511	5,153	--	Sri Lanka 3,770; Philippines 1,200.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	480	--	--	
Carbon: Carbon black	4,973	2,251	--	Indonesia 750; Sri Lanka 664; India 387.
Petroleum refinery products:				
Kerosine and jet fuel, 42-gallon barrels	428,541	88,443	--	NA.
Lubricants, do.	140,790	462,136	--	NA.
Unspecified, do.	10,747	3,141	--	Singapore 2,563.

rRevised. NA Not available.
[1]Table prepared by Audrey D. Wilkes.
[2]Less than 1/2 unit.

Table 3.—Thailand: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	Sources, 1983	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals, kilograms	16,950	12	4	West Germany 6.
Aluminum:				
Ore and concentrate	285	3,557	--	Malaysia 2,750; China 807.
Oxides and hydroxides	11,851	11,409	46	Japan 7,116; China 3,877.
Metal including alloys, all forms	62,340	69,618	3,015	Canada 24,160; Australia 16,949; Bahrain 7,466.
Antimony:				
Ore and concentrate	--	776	--	All from Burma.
Metal including alloys, all forms	25	157	--	China 117.
Arsenic: Oxides and acids	289	139	--	China 69; West Germany 36.
Chromium:				
Ore and concentrate	47	108	--	Finland 72; Belgium-Luxembourg 36.
Oxides and hydroxides	334	339	37	West Germany 232.
Metal including alloys, all forms, kilograms	455	13	--	Republic of Korea 12.
Cobalt:				
Oxides and hydroxides	5	8	(2)	Belgium-Luxembourg 4; Canada 3.
Metal including alloys, all forms, kilograms	333	169	16	Japan 75; West Germany 50.
Copper:				
Sulfate	100	57	--	France 23; Taiwan 20.
Metal including alloys, all forms	24,722	28,802	72	Japan 14,607; Zambia 6,396; Taiwan 2,416.
Gold: Metal including alloys, unwrought and partly wrought, troy ounces	425,293	145,799	43,950	Singapore 92,388.
Iron and steel: Metal:				
Scrap	389,928	641,288	65,284	Taiwan 163,667; Republic of Korea 121,632; Canada 46,455.
Pig iron, cast iron, related materials	14,734	17,094	3	Japan 16,966.
Ferroalloys:				
Ferrochromium	34	240	--	U.S.S.R. 190.
Ferromanganese	2,973	4,017	--	Australia 1,843; Belgium-Luxembourg 1,047; Norway 496.
Ferrosilicomanganese	397	731	--	Taiwan 490; Austria 200.
Ferrosilicon	3,003	3,538	12	Norway 1,458; Yugoslavia 988; France 332.

See footnotes at end of table.

Table 3.—Thailand: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	Sources, 1983	
			United States	Other (principal)
METALS —Continued				
Iron and steel: Metal —Continued				
Ferroalloys —Continued				
Unspecified	r202	2,143	7	Taiwan 1,233; Belgium-Luxembourg 458.
Steel, primary forms	457,537	521,217	(2)	Japan 123,864; Republic of Korea 84,356; Australia 47,646.
Semimanufactures, thousand tons	1,185	1,495	18	Japan 1,138.
Lead:				
Oxides	483	436	--	Australia 372.
Metal including alloys, all forms	11,348	20,538	1,347	Australia 9,706; Burma 2,019; China 1,827.
Manganese:				
Ore and concentrate, chemical-grade	2,932	--	--	
Oxides	163	309	(2)	Japan 247; China 45.
Mercury, 76-pound flasks	315	246	1	Netherlands 109; West Germany 74; Japan 34.
Nickel: Metal including alloys, all forms	2,444	949	13	Canada 398; West Germany 258; Norway 119.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, troy ounces	3 1,286	1,511	64	Japan 1,157.
Silver:				
Ore and concentrate[4]	54	1,133	--	Philippines 805; China 260.
Metal including alloys, unwrought and partly wrought, troy ounces	417,991	384,169	17,522	Japan 157,185; West Germany 114,135; France 55,942.
Tin: Oxides, kilograms	34,000	300	(2)	Mainly from Japan.
Titanium:				
Ore and concentrate	1,225	1,235	--	Australia 1,230.
Oxides	757	846	2	Japan 343; Belgium-Luxembourg 255.
Tungsten: Metal including alloys, all forms	2	5	(2)	Japan 3.
Zinc:				
Oxides	581	548	(2)	Japan 249; China 185; Taiwan 75.
Blue powder	50	52	--	Norway 28; Singapore 14.
Metal including alloys:				
Unwrought	33,857	36,258	151	Australia 23,809; Canada 5,548; Japan 2,266.
Semimanufactures	247	556	(2)	Japan 313; West Germany 111.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	2,345	2,492	37	Netherlands 1,573; India 683.
Artificial:				
Corundum	277	579	(2)	Japan 561.
Silicon carbide	611	331	(2)	China 131; West Germany 62; Switzerland 50.
Dust and powder of precious and semiprecious stones, including diamond, kilograms	1,948	29	7	United Kingdom 10; Belgium-Luxembourg 7.
Grinding and polishing wheels and stones	1,697	2,512	22	Japan 986; Taiwan 518; China 182.
Asbestos, crude	54,332	55,967	7,844	Canada 22,436; Botswana 14,386; Zimbabwe 5,440.
Barite and witherite	5,000	1	--	All from West Germany.
Cement	883	11,065	NA	Japan 10,680.
Clays, crude	r9,394	15,253	3,717	Australia 3,598; China 3,511; United Kingdom 1,567.
Cryolite and chiolite, kilograms	28,000	400	--	All from United Kingdom.
Diamond:				
Gem, not set or strung, carats	r141,161	279,956	5,445	India 185,894; Belgium-Luxembourg 49,309; Hong Kong 22,527.
Industrial stones, do	3,485	1,490	--	Belgium-Luxembourg 1,000; Zaire 400.
Unsorted, do	818,056	250,769	30,394	India 98,076; Ghana 75,799; Belgium-Luxembourg 36,864.
Feldspar and nepheline syenite	2,252	1,512	--	Ghana 1,000; Finland 322; Japan 176.
Fertilizer materials: Manufactured:				
Ammonia	1,546	2,307	(2)	Japan 1,133; Taiwan 429; Indonesia 295.
Nitrogenous	311,643	506,493	56,280	Japan 161,042; West Germany 118,006; Republic of Korea 73,271.
Phosphatic	6,228	5,407	3,900	Netherlands 1,506.
Potassic	50,964	72,719	6,000	U.S.S.R. 30,405; West Germany 16,952; East Germany 9,971.
Unspecified and mixed	550,821	880,057	62,532	Republic of Korea 304,970; Romania 196,452; West Germany 97,139.

See footnotes at end of table.

Table 3.—Thailand: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	Sources, 1983	
			United States	Other (principal)
NONMETALS —Continued				
Fluorspar	681	1,783	22	India 998; Finland 611.
Graphite, natural	369	733	--	China 513; Republic of Korea 110; Taiwan 44.
Gypsum and plaster	581	661	81	Japan 283; West Germany 189; China 108.
Iodine kilograms	1,824	1,569	--	West Germany 516; Netherlands 400; Japan 350.
Magnesium compounds: Magnesite	2,880	6,470	--	China 3,542; Japan 2,409.
Mica, all forms	127	212	3	Japan 82; Taiwan 59; India 49.
Pigments, mineral: Iron oxides and hydroxides, processed	1,694	2,607	17	West Germany 1,710; Japan 403; United Kingdom 129.
Precious and semiprecious stones other than diamond:				
Natural kilograms	279,073	166,418	8,840	Burma 110,749; Australia 23,836; Sri Lanka 3,772.
Synthetic do.	14,081	16,097	6,213	Switzerland 3,561; Taiwan 1,822; France 1,777.
Salt and brine	45,168	21,149	11	Australia 20,718.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	58,079	81,985	30,936	Romania 30,023; Kenya 12,200; East Germany 3,293.
Sulfate, manufactured	14,736	20,023	3,987	China 6,709; West Germany 4,519; Finland 2,000.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	66,171	6,880	--	Italy 6,204.
Worked	1,060	1,048	(2)	Italy 949.
Sand other than metal-bearing	71	310	54	Norway 144; Hong Kong 100.
Sulfur:				
Elemental, crude including native and byproduct	31,742	30,991	6,126	Canada 14,839; Singapore 9,574.
Sulfuric acid	6,053	16,895	1	Philippines 8,990; Japan 7,839.
Talc, steatite, soapstone, pyrophyllite	13,931	19,159	62	Republic of Korea 10,389; China 8,624.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	4,308	4,531	42	China 2,867; Taiwan 613; Japan 316.
Coal: All grades including briquets	107,436	117,581	NA	Australia 95,673; Indonesia 17,903.
Coke and semicoke	52,315	51,573	15	China 24,999; Japan 23,912.
Petroleum:				
Crude thousand 42-gallon barrels	46,789	48,901	--	Saudi Arabia 25,041; Malaysia 12,296; Brunei 3,913.
Partly refined do.	7,277	6,112	--	Mainly from Saudi Arabia.
Refinery products do.	16,196	13,922	237	Singapore 8,477; Saudi Arabia 2,202.

[r]Revised. NA Not available.
[1]Table prepared by Audrey D. Wilkes.
[2]Less than 1/2 unit.
[3]Excludes unreported quantity valued at $9,600.
[4]May include other precious metals.

COMMODITY REVIEW

METALS

Copper.—Exploration by DMR in the Khao Loan hills, Nong Khai Province, has revealed ancient copper workings with former mine workings up to 20 meters deep. Twelve sites were sampled and reportedly indicated a large deposit of potentially commercial grade.[r] Thailand has not been a commercial producer of copper ore.

Gold.—Thailand's first commercial gold mining since 1941 has been authorized by the Government. Two gold exploration and mining concessions were awarded to Aokham Thai Ltd., a company engaged in offshore tin dredging. The concession areas include an abandoned underground working at Toh Moh in Narathiwat Province near the Malaysian border and the old Kabinburi underground mine in Prachin Buri Province 140 kilometers east of Bangkok.

It was planned to form a new company

called Masphum Co. Ltd., which will be composed of mainly Thai private and Government holdings plus a 30% interest by the Malaysian company Aokham Tin Bhd. The company proposes a $3 million exploration and development program at the sites. Planned output would be about 900 kilograms of gold per year.[8]

Tantalum and Columbium.—Construction of the Thailand Tantalum Industry Co. Ltd.'s (TTIC) tin slag processing plant, begun in June 1982, has yet to be completed. TTIC reportedly stopped construction late in 1984, because world prices and demand for tantalum oxide were not adequate to ensure a profitable return. Another complicating factor was that, at the current level of tin metal production in Thailand, the amount of domestic tin slag available would have been insufficient to run the plant at full capacity. TTIC and the Government were considering the possibility of importing tin slag if supplies in Thailand are inadequate. Under the present circumstances, the tantalum plant was not expected to be operational before 1986.

Tin.—Foreign and domestic politics and economic policies appeared to be more influential to the tin sector this year than any tangible developments in tin mining or processing. The overriding problem was a world surplus of tin metal and how best to equitably resolve it. A world decline in tin consumption, which began in the early 1980's and continued through 1984, has complicated an already delicate situation. The International Tin Council (ITC) adopted production controls in 1982 for each of its members, with Thailand's production cutback on the order of 40%. The burden of this reduced production quota fell most heavily on the small-scale legitimate mine operators.

The Thai miners' feelings about the situation have been strong and vocal during the year. The tin mining industry council, or council of mines, an organization of private mining companies, has urged the Government to withdraw from the International Tin Agreement and remove the tin export controls. Also under fire by the miners was the Government's high tin royalty or taxing system, reported to be five times the Malaysian rate.[9] The high tax and export quotas have led to an exacerbation of the chronically serious smuggling problem. Government sources estimate 5,000 tons of tin concentrate was smuggled out of the country in 1984. Other sources state the amount was much higher. Thai and other Governments started countermeasures with some success. The Government's position remained firm in staying with the ITC agreement. It felt that the long-term benefits of the stable market outweigh any short term benefits of dropping from the agreement. It felt that uncontrolled Thai production would so increase the world tin glut that prices could fall as much as 50%. This would in turn close more than 300 Thai mining operations, employing about 10,000 miners. The considerable amounts of smuggled tin entering the market also add to the world surplus, estimated to be about 70,000 tons out of a total world market of 180,000 tons. One of the Thai Government's efforts to help the beleaguered miners has been to suspend the issuance of any new tin mining licenses or concessions. The Ministry of Industry has also reduced some fees and operational charges to aid the miners.

Billiton Thailand Ltd., which operates an offshore dredge under contract to the Government's Offshore Mining Organization, suspended its operation for several weeks in October and November because of continuing financial losses owing to the quota restrictions. The company stated it could not operate profitably at less than 700 tons per year. Its tin quota was then reviewed by the DMR, under pressure from the miners' union, and raised to 230 tons for the first quarter of 1985 in order to keep the operation going a few months longer.

Billiton's Thailand Smelting and Refining Co. Ltd. (Thaisarco) tin smelter was also losing heavily and in danger of closing if the tin situation didn't change soon. Thaisarco must purchase tin concentrate at the prevailing Kuala Lumpur Tin Market price while 80% of its tin was sold at the effectively lower London Metal Exchange price. In effect, Thaisarco subsidized the tin miners to the amount of $6 million during 1984. The issue of changes in the tin sector is very sensitive politically, and there was no clear cut solution in sight at yearend.

The results of the offshore tin surveys conducted in deep water during the past 2 years were reported to be "very satisfying." A large potentially economic tin deposit was reported 35 kilometers off the Phangnga-Phuket coast in 61 meters of water. Recovery of alluvial tin at that depth and distance from the shore would require entirely new equipment and some very sophisticated technology.[10]

Zinc.—Production began at the Mae Sot

Mine early in the year in order to stockpile ore for the opening of the Tak refinery in November. The mine was designed to produce 350,000 wet tons of high-grade silicate-oxide ore during an 8- to 9-month mining season. The surface mine will not be operated during the June to September rainy season.

Construction of the 60,000-ton-per-year refinery was completed in November and trial runs began at that time. A ruling by environmental authorities caused concern but no delay in startup trials. Possible cadmium contamination of the plant effluent will require construction of an additional waste water treatment circuit at a cost of about $900,000. During the first year of operation, Padaeng Industry Co. planned to operate the plant at 80% of rated capacity. The refinery used a sophisticated hot acid leach system to produce a zinc sulfate solution, which is filtered to remove the main insoluble impurities. Small amounts of dissolved arsenic, cadmium, copper, nickel, and tin are then removed from solution by cementation. The zinc sulfate solution then goes to a highly automated electrolytic cell house where the zinc metal is deposited on aluminum cathodes. Zinc is stripped, melted, and cast into ingots for shipping. Most of the production will be used domestically.[11]

Other Metals.—The DMR's canvass of the old tin mine tailings and waste piles continued in 1984. Another 343 mines in 20 Provinces were canvassed but the results were not published. The 1983 survey recorded about 35,000 tons of monazite at 222 tin mine waste dumps and in the remaining tin reserves. Monazite contains thorium and rare-earth elements.

NONMETALS

Cement.—Overall capacity remained at about 9 million tons per year after a precipitous rise from 5.7 million tons in 1980. Three new plants, however, were apparently under construction. A new company in cement production, Union Thai Cement Industry Ltd., plans to complete a 3,000-ton-per-day plant in Kok Samrong District in Lop Buri in mid-1986. Output will be primarily for export. Siam Cement Co. Ltd. was working on a new 4,000-ton-per-day kiln at its plant in Kaeng Khoi District in Saraburi. Startup was scheduled for late 1986. Siam City Cement Co. Ltd. was also to build a 4,000-ton-per-day plant in Kaeng Khoi District for operation in 1987. Construction was believed to have started in 1984. Completion of these three projects would raise capacity to 13.6 million tons per year. Consumption increased rapidly in 1983 and 1984 as a result of a recovery in construction. Even so, a significant amount of cement should be available for export during the next few years. Fierce price competition is expected to be encountered, however, from Japan, the Republic of Korea, and Taiwan.

Fertilizer Materials.—*Nitrogenous.*—In March, National Fertilizer Corp. Ltd. (NFC) eliminated 24 of the 37 international construction companies that were interested in bidding on the fertilizer complex. Bids from the remaining 13 were submitted in early July for the long-proposed nitrogen-phosphorus-potassium fertilizer complex in Mab Ta Pud in Rayong Province. Surprisingly low bids were received for the complex, and it appeared that all was going smoothly for a mid-1985 start of construction. Late in the year, however, problems relating to the financing and ownership of the project were encountered. Government loan guarantees were not available to NFC under its 55% Thai private and 45% Thai Government ownership. As a result, the already negotiated loans from overseas lenders were jeopardized. It was then reported that a meeting of Thai Economic Ministers decided to change NFC to 100% Government ownership. Restructuring of the company would extend well into 1985. It was unclear if a new board of directors would proceed with the submitted bids or call for new submissions.[12] In either case, construction of what was to be the largest single industrial project in Thailand was not likely to be started in 1985. Thailand will therefore continue to be wholly dependent on expensive imports for all of its fertilizer needs for at least several more years.

Potash.—The DMR'S flooded carnallite mine at Bamnet Narong in Chaiyaphum Province may get a new start in 1985. A new feasibility study showed that the underground flooding could be circumvented by starting at another site and sinking a concrete-lined vertical shaft. Final approval by the Government depends heavily on the financing arrangements and whether another International Bank for Reconstruction and Development loan would be approved for the new shaft.

If the carnallite can be economically mined and processed into potassium fertilizer, it will open up large deposits on the

Khorat Plateau to commercial exploitation. The Bamnet Narong Mine could also supply salt as a byproduct to the proposed Association of South East Asian Nations (ASEAN) soda ash project.

After years of planning and negotiating, there has been some progress toward mining the higher grade but less extensive deposits of sylvite on the Khorat Plateau. The Thai Government signed its first concession for the detailed exploration and development of the sylvite deposits in September with Thai Potash Co. Ltd. The company consists of Duval Corp. (United States, 35%), CRA Exploration Pty. Ltd. (Australia, 35%), Siam Cement (Thailand, 20%), and the Thai Government (10%). Thai Potash is committed to spend $3 million for exploration over the next 5 years in a 3,500-square-kilometer area in Khon Kaen and Maha Sarakham Provinces.

The Government approved the granting of concession rights to Agrico Potash Co. Ltd. in September, but it was not known if a contract was signed at that time. The company consists of Agrico Chemical Co. (United States, 50%), Thai Central Chemical Co. Ltd. (Thailand, 40%), and the Ministry of Finance (Thai Government, 10%). Agrico Potash's concession is a 2,333-square-kilometer area of Udon Thani Province. If the detailed exploration program shows that the deposits can be developed economically, then the companies have production rights for 25 years, subject to a complicated set of regulations and conditions.

A third consortium, Khorat Potash Co. Ltd., led by AMAX Exploration Inc. of the United States, was supposed to sign a contract in December, but the arrangement fell through at the last minute, and AMAX was reportedly banned from further consideration. The Government then called for new bids on the 144-square-kilometer area in Sakon Makhon Province.[13]

Salt.—The on again, off again ASEAN salt mine and soda ash project was considered again during the year. First proposed in 1976, the project has been a continuing problem, both economically and politically since its inception. In 1983, the project was shelved by the Minister of Industry, ostensibly because of lack of support from the other ASEAN countries. The newly revised plan called for a scaled down output of 300,000 tons per year of soda ash rather than the 400,000 tons or more originally proposed. The reduced size of the project would also lower the construction cost by $100 million to about $267 million. The plant would be built near the deepwater Port of Sattahip.

Thick salt beds underlie vast areas of the Khorat Plateau, but the site of the salt mine has not been finalized. One possibility was to mine the salt at DMR's experimental carnallite mine at Bamnet Narong. (See "Fertilizer Materials—Potash.") The final decision on the soda ash project was pending at yearend.

Other Nonmetals.—A Thai- and Philippine-owned company, Swan Marble Co. Ltd., has applied for permission to set up a marble quarry and marble tile finishing plant. The mine would be in Amphoe Prankrathai, which is probably in Kamphaeng Phet Province. The company planned to produce annually 30,000 square meters of marble and 18,000 square meters of marble tiles.

The ASEAN council has approved plans for a joint Thai-Indonesian (60%-40%) feldspar mining project in Tak Province. The $2 million project would be operated by the Pacific Impex Co. Ltd. of Thailand and P.T. Ansardaya Co. of Indonesia. Plans call for a flotation plant that would produce 27,000 tons of potassium feldspar and 10,000 tons of quartz from a mine output of 60,000 tons per year. The output would be mainly for the Thai glass and ceramics industry but about 25% would be exported to Indonesia and Malaysia, both ASEAN members.

MINERAL FUELS

Coal and Lignite.—The Government continued to encourage the use of lignite as a substitute for expensive imported fuel oil. The electric powerplants at Krabi, Lampang, and Mae Moh, are by far the major consumers. Private industrial plants, however, were reporting favorable results from switching to lignite. Locally produced lignite costs about one quarter that of fuel oil per British thermal unit of energy. Even after the cost of switching boilers to handle the solid fuel, local food processing and textile plants reported energy savings of 30% to 60%. Four private companies produced lignite in addition to the big Government electric power complexes.

Lignite consumption by private industry was expected to increase steadily in the next few years. Exploratory drilling by DMR during 1984 delineated an additional 16 million tons of probable reserves in the Krabi area. More drilling was planned in other areas.

The first lignite production line for Electricity Generating Authority of Thailand's

new powerplant at Mae Moh was put into operation after midyear. A performance test of the semimobile crushing plant reportedly handled well over the guaranteed throughput of 1,200 cubic meters per hour. Output from the mine and crusher will be moved by conveyor belt to the new powerplant. The second lignite production line was under construction.[14]

Petroleum and Natural Gas.—The natural gas situation has gone from a controversy involving insufficient supply in 1983 to the potential problem of oversupply by mid-1985. Major developments during 1984 were the trial startup of two new offshore gasfields, the continuing exploration and development of onshore oil and gas reserves, and the completion of a $200 million gas separation plant at Mab Ta Pud in Rayong Province. The plant is designed to produce 450,000 tons of LPG, 350,000 tons of ethane, and 64,000 tons of natural gasoline per year.

Offshore, platform construction and both developmental and exploration drilling continued at a brisk pace, with 17 wells being sunk and 13 of them hitting natural gas. No crude oil was struck in commercial quantities. By yearend, Union Oil Co. of Thailand, currently the only offshore producer, had 31 platforms, 300 kilometers of pipeline, and a floating-storage tanker operating in the Gulf of Thailand. At yearend, Union Oil began production testing from two new gasfields—Platong and Satun. Satun Gasfield was to go on-line in January 1985, and Platong Gasfield, a few weeks later. The overall capacity of Union Oil's offshore fields will be about 450 million cubic feet per day when the new fields reach design capacity. Union Oil has spent about $2 billion on exploration and development of its Gulf of Thailand concessions.

Development of Texas Pacific (Thailand) Inc.'s (TP) B-structure Gasfield farther south in the Gulf of Thailand was still stymied after 7 years of discussion, because of the inability of TP and the Petroleum Authority of Thailand (PTT) to agree on a pricing structure for the huge gas reserves. Needing to recover some of its large exploration investment, TP offered to sell its concessions back to PTT if the price was fair. PTT has been looking into the possibility of developing the field with the idea of liquefying and exporting the natural gas. Several Japanese companies were interested in setting up a joint venture with the Thai interests. The first order of business would be a detailed feasibility study on this extremely expensive proposal.

Exploration continued both onshore and offshore as more than a dozen foreign firms or partnerships were operating in the country. New blocks were opened for bidding and at least a dozen operators participated during the year. Awards of three blocks were to be announced early in 1985. Production sharing contracts were offered for the onshore tracts, while concessions were offered for the offshore acreage.

Onshore, Thai Shell Exploration and Production Co. Ltd. drilled 23 holes during the year. Some were developmental wells at the Sirikit Oilfield and others were exploration wells in other geologic structures.

A small discovery about 3 kilometers west of the Sirikit Field was being developed as the Sirikit West Oilfield. Planned output would only be 1,200 to 1,500 barrels per day, not an economically justifiable flow if it was not in close proximity to the main oilfield. Thai Shell wells drilled in the Mae Nam Nan area of Uttaradit Province were promising for oil. Additional work would be needed in 1985 to determine the area's production feasibility.

In addition to the Thai Shell wells, North Central International Inc., Esso Udon Inc., Esso Exploration and Production Khorat Inc., and Esso Sakon Inc. in conjunction with Phillips Petroleum Co. Thailand all drilled one or more wells during 1984. North Central's first well was an oil discovery about 9 kilometers northwest of Thai Shell's Sirikit Oilfield. A development well was planned for 1985. Esso Khorat's gas discovery in Khon Kaen Province has the potential to supply gas to the northeast region. Exploration costs in this remote area were more than double the offshore drilling costs. Development of the field, therefore, would depend on the pricing structure negotiated with PTT.

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[1]Physical scientist, Division of International Minerals.

[2]During 1984, the Thai baht (B) was devalued against the dollar. Values ranged from B23.0=US$1.00 to B27.15=US$1.00. B23.639=US$1.00 was the yearly average.

[3]U.S. Embassy, Bangkok, Thailand. State Dep. Telegram 25142, May 1985.

[4]Bank of Thailand, Department of Economic Research. Thailand: Economic Conditions in 1984 and the Outlook for 1985. P. 23.

[5]The less than 500-barrel-per-day Fang Oilfield has been operated by the Thai military for many years.

[6]Work cited in footnote 3.

[7]Mining Journal (London). V. 304, No. 7805, Mar. 22, 1985, p. 198.

[8]Engineering and Mining Journal. V. 185, No. 12, pp. 11, 75.

[9]The Nation Review (Bangkok). Nov. 2, 1984, p. 19.

[10]Bangkok NAEO NA in Thai. June 8, 1984, p. 9.

[11]Business in Thailand. V. 16, No. 1, p. 24.

[12]Fertilizer International. No. 194/5, Jan. 31, 1985, p. 7.

[13]Mining Journal (London). V. 304, No. 7796, Jan. 18, 1985, p. 37.

[14]International Mining. V. 1, No. 11, p. 8.

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